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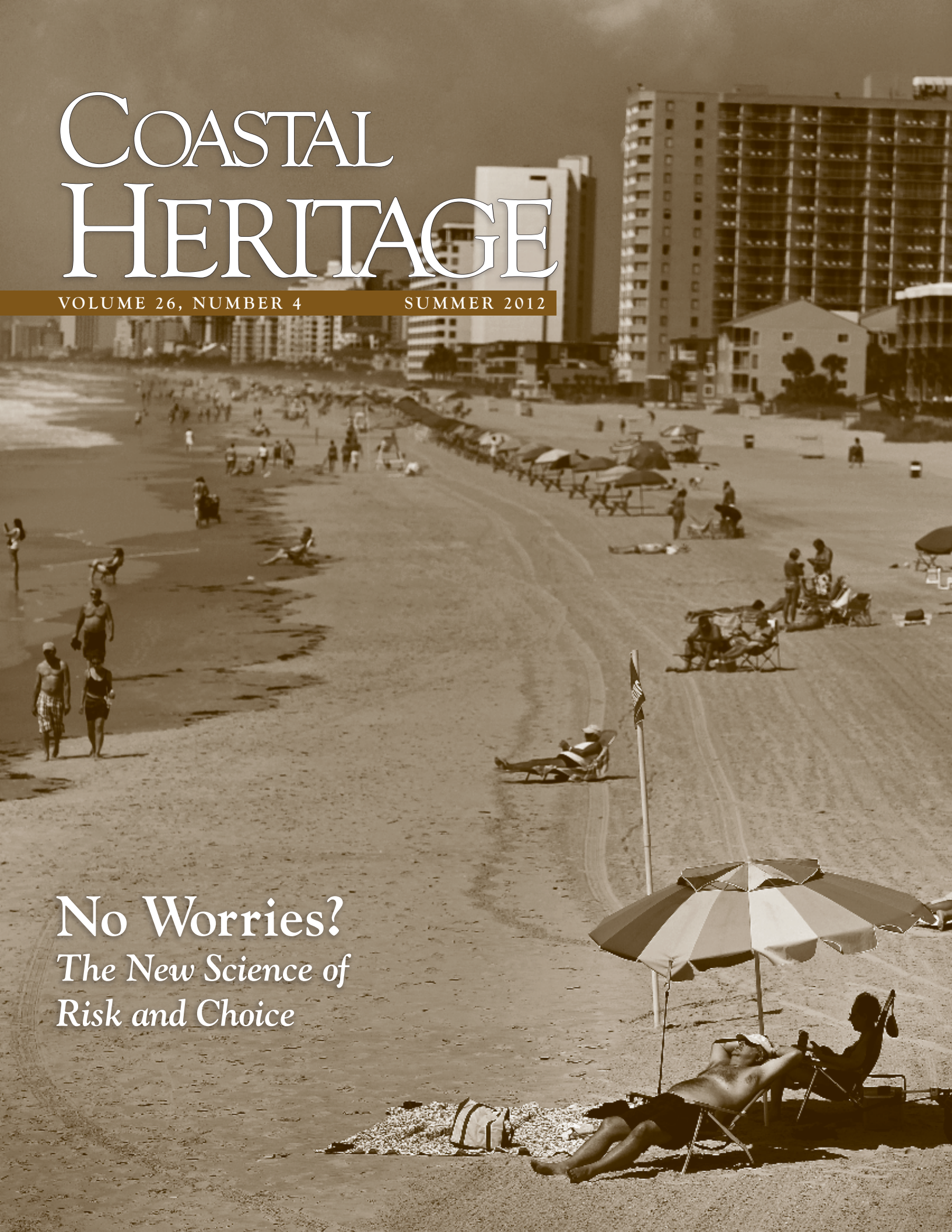

No Worries?

The New Science of Risk and Choice

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PHOTO/GRACE BEAHM

COASTAL HERITAGE
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Coastal Heritage is a quarterly publication of the S.C. Sea Grant Consortium, a university-based network supporting research, education, and outreach to conserve coastal resources and enhance economic opportunity for the people of South Carolina. Comments regarding this or future issues of ***Coastal Heritage*** are welcomed at John.Tibbetts@scseagrant.org. Subscriptions are free upon request by contacting:

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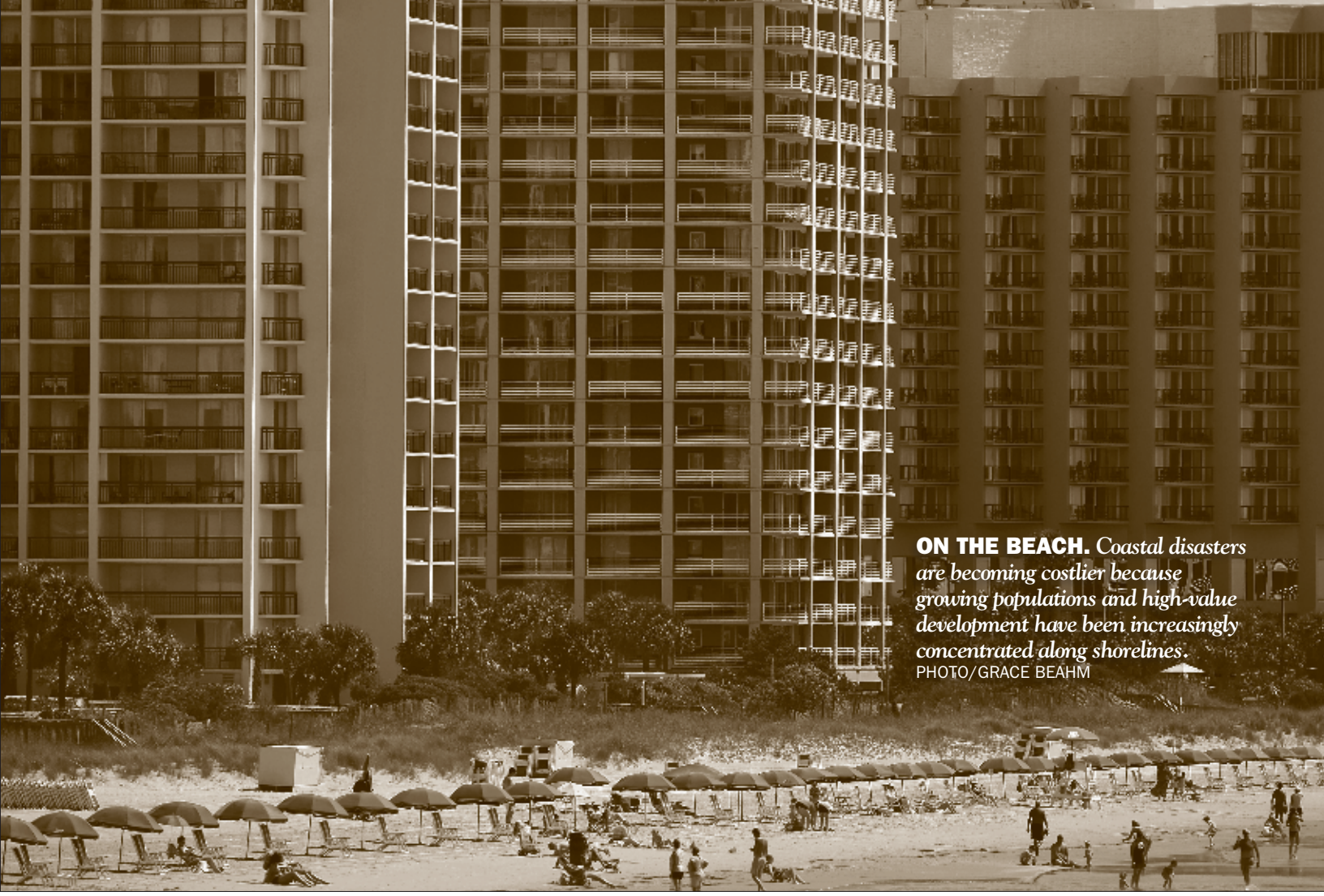


ON THE BEACH. *Coastal disasters are becoming costlier because growing populations and high-value development have been increasingly concentrated along shorelines.* PHOTO/GRACE BEAHM

No Worries?

The New Science of Risk and Choice

by John H. Tibbetts

A giant SUV cuts you off in evening traffic. Braking hard, you maneuver out of danger. Thank your quick reflexes for that. At home, your toddler's drooping eyes signal her exhaustion. Carry her early to bed. At supper, you feel a chill in the room—it's your spouse's icy stare—so the Blackberry is turned off and stashed away.

We make countless rapid decisions a day. We can react effectively to a physical threat—an aggressive driver—and minutes later respond to fleeting, unspoken signals from a loved one.

This kind of intuitive, reactive thinking serves us well much of the time. But the human brain often makes mistakes, especially when it must choose between our short-term desires and longer-term welfare.

Of course, it's reckless to text and drive, or to eat a half-dozen glazed doughnuts for breakfast every morning, or to put up a luxury home on a narrow, dynamic strip of beach in a hurricane-prone region as sea level rises—yet people keep doing them anyway.

Seven years after Hurricane Katrina hit New Orleans, people continue flocking back into the city, rebuilding homes and businesses on sites below sea level. New Orleans now has nearly the same population as it did before the storm.

Engineers have mended floodwalls that collapsed, upgraded pumping facilities, built new floodgates, and reconstructed walls that had obvious structural weakness. But storm-buffering salt marshes continue to drown and global sea level continues to rise. So New Orleans will face an increasing threat from storm surges for many years to come. Why move back there?

"People don't perceive risk," says Dennis Mileti, a professor emeritus of social psychology at the University of Colorado. "When you build a dam or levee, people believe they are totally safe. Politicians allow more development behind the levee, which only postpones future [disaster] losses, and

there are more people to kill. Nature always exceeds what people build for."

At some point, Charleston evidently forgot the catastrophic earthquake of 1886. Says Mileti, "When you look around Charleston now and see all of the unreinforced masonry buildings, you'd think there was not an earthquake threat there."

Before Hurricane Katrina, many residents similarly forgot about the New Orleans' flood-protection system. Or perhaps they just took it for granted, failing to understand that every levee and floodwall has the potential to fail. Levees, dams, and beach-nourishment projects are seen as permanent features, though of course they only hold back forces of nature that can't be contained forever.

For thousands of years, people around the world have built and rebuilt towns and cities on coastlines vulnerable to hurricanes, floods, earthquakes, and tsunamis.

But coastal disasters have become more costly than ever. Over the past two decades, much of the nation's explosive population and economic growth has been concentrated in hazardous places, including the hurricane-prone Gulf and Atlantic coastlines.

Florida, for instance, had 13 million people in 1990. Two decades later, its population had ballooned to 19.3 million. Hurricane Andrew, which hit South Florida and Louisiana in 1992, caused $23 billion in damages in 2007 dollars.

Damages from the same storm would be vastly greater today. If Hurricane Andrew had followed the same path in 2004, it would have cost $120 billion in damages in 2007 dollars.

Now, social scientists are increasingly studying how coastal residents perceive their disaster risks and choices.

"People want to live and do business along the coast, but we need to help them understand their risk exposure so they can take actions to minimize losses before disasters strike," says Tricia Ryan, manager of the Human Dimensions Program at the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center based in Charleston, S.C. "Studies by social scientists can help us understand the tremendous benefits of doing mitigation—whether

QUAKE-PRONE. *After a catastrophic 1886 earthquake, Charlestonians strengthened local buildings, but memories eventually faded and preventive lessons were lost.*
PHOTO/U.S. GEOLOGICAL SURVEY PHOTOGRAPHIC LIBRARY

it's elevating structures or not developing in hazardous areas in the first place—rather than just responding after the fact."

Still, why don't we worry more about natural disasters? Why don't we plan and build more effectively for dangerous, costly storms before they strike?

Cognitive research shows that we can't understand our disaster risks and choices unless we set our minds firmly to the task. But that would require hard work, which the human brain avoids.

As Daniel Kahneman, a professor emeritus of psychology at Princeton University, puts it: "Laziness is built deep into our nature."

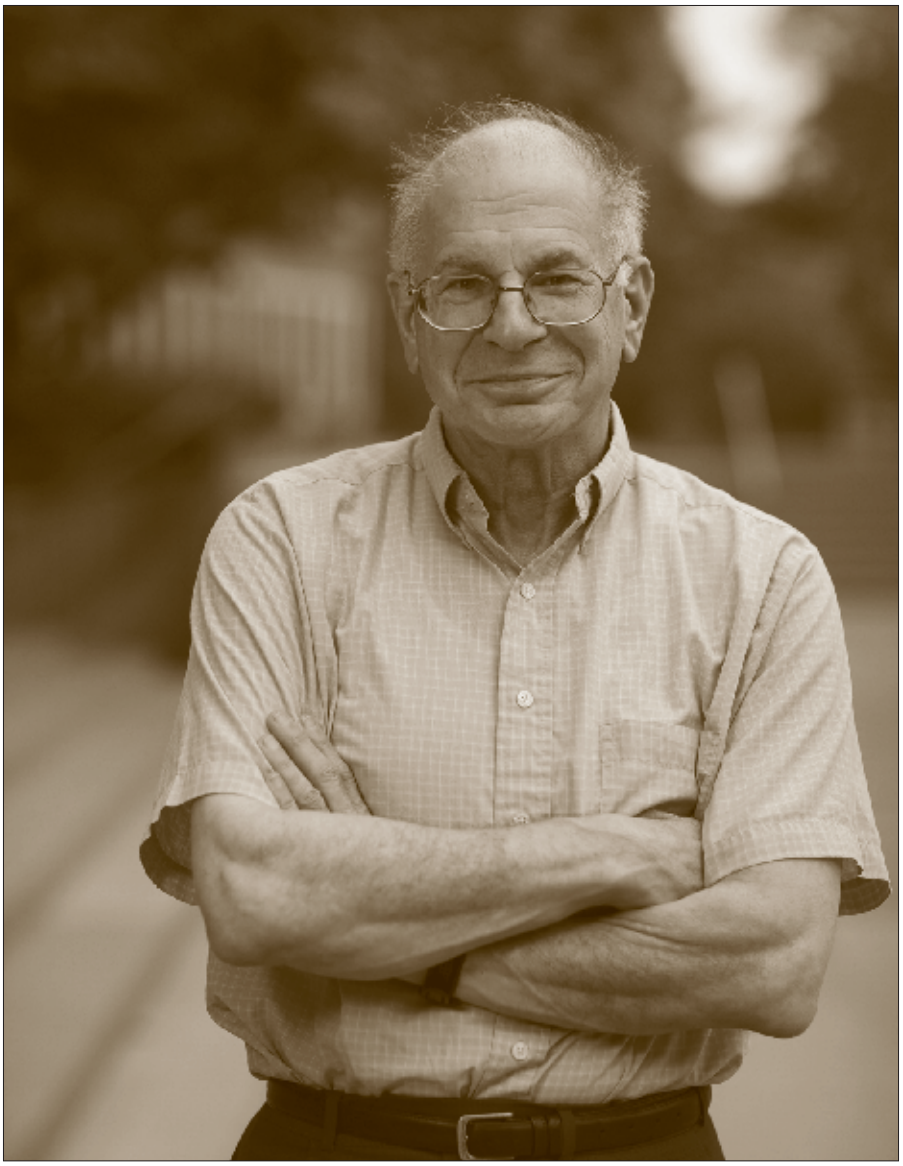
GLUCOSE AND REASON

One day early in his research career, Kahneman happened to read a study written by an economist at his own university.

"I can still recite its first sentence: 'The agent of economic theory is rational, selfish, and his tastes do not change.' I was astonished. My economic colleagues worked in the building next door, but I had not appreciated the profound difference between our intellectual worlds. To a psychologist, it is self-evident that people are neither fully rational nor completely selfish, and that their tastes are anything but stable."

Kahneman had encountered one of the most powerful ideas in human history—standard economic theory—and recognized that it did not make much sense in the world he knew.

Standard—also known as classical—economic theory says that the human mind is an efficient calculating machine. That is, individuals are almost always rational. Human beings have the same preferences and desires from year to year, and these "rational actors" resolutely pursue their individual happiness and personal welfare. People are irrational only if they are gripped by extreme emotions such as fear, hate, or love.



GLOBAL THINKER. ***Daniel Kahneman's research shows that human beings don't behave rationally much of the time.***
PHOTO/JON ROEMER

When buyers and sellers are nearly always selfish and rational in their decisions, producers of goods and services compete relentlessly in the marketplace, and this competition spawns innovation and creates wealth.

The reality, though, is that human beings don't behave rationally nearly all of the time. If we did, we'd seem alien indeed. We would behave, more or less, like Mr. Spock, the super-rational half-Vulcan in the *Star Trek* television series.

Instead, we depend primarily on emotion and intuition to perceive the world and navigate our lives.

"We think by feeling. What is there to know?" wrote the poet Theodore Roethke. The past 40 years of cognitive science proves him mostly right.

In the early 1970s, Daniel Kahneman and his friend and fellow psychologist Amos Tversky became pioneers of a new field of science. Over the next 15 years, their experiments reshaped how scientists think about thinking.

In 2002, Kahneman won the Nobel Prize for economics "for integrating insights from psychology into economics." (Tversky died in 1996, and

the prize is not given posthumously.)

In his 2011 book, *Thinking, Fast and Slow*, Kahneman synthesizes his research and that of his colleagues in psychology, sociology, neurology, and in the relatively new and increasingly influential field of behavioral economics, which draws on both economics and psychology.

To understand how people think, we must realize that the human brain has many different structures, some primitive and some sophisticated, dating from various stages of evolution.

Some two hundred million years ago, evolution provided ancient lizards with simple brains so they could hunt and survive in a dangerous world. A lizard's brain controls the animal's heart rate and breathing, and processes information from its eyes, ears, and mouth, telling it to fight or flee.

The human brain still has that wiring. If someone throws a ball at your head, you'll duck. That's a response by your ancient "lizard-like brain."

When mammals evolved later, a second layer of brain cells and connections was added. In a mouse, for instance, this second layer gave it more memory and a broader range of emotions.

For great apes, evolution added a third layer. A great ape needs a brain with an even larger memory to function within a far more complex society than that of a mouse. Over the past 6 to 7 million years, at least 20 hominid species, our closest ancestors, evolved and eventually became extinct, many of them having increasingly large brains. Then about 180,000 years ago, our species, *Homo sapiens*, emerged with the largest brain of all.

But size can't explain everything. Women generally have smaller brains than men. So there must be other reasons why humans developed cognitively beyond other great apes and hominid species. Perhaps we advanced farther because our brain's neural circuits became more interconnected and efficient. Or maybe our brains developed stronger, speedier neural pathways.

INVINCIBLE. ***A texting skateboarder on a busy city street. People tend to overestimate their skill and underestimate their vulnerability to risk.***
PHOTO/GRACE BEAHM

From the beginning, our species lived in kin-based groups that were intensely social and psychologically intricate. We needed higher-functioning brains to store and analyze our long-term memories so we could plan hunting-and-foraging expeditions, resolve conflicts, and pass down knowledge to the next generation.

Yet our primitive brain mechanisms are still with us. The human brain stem—similar in function to a lizard brain—continues to transmit physical sensations of attraction, repulsion, and pain.

During our first five years of life, our brain's circuitry is being developed and linked together—from newer structures to older ones. When we're about 20 years old this process is complete. Many of our older, sensory-based brain structures work in tandem with our newer memory-based cognitive networks.

For instance, our brain can recognize subtle signals of another person's mood—a child's weariness, a spouse's annoyance—in an instant by remembering similar emotional signals from past experiences and then adjusting our social behavior as needed.

We often know things emotionally before we know them logically. That is, we first understand them intuitively.

Intuition isn't a mystical thing, scientists say. It's a very fast recognition system. Intuition allows us to recognize familiar things in new or different contexts and respond appropriately to them.

Scientists have a name for the intuitive thinking process: the Automatic System. Quick, visceral, reactive, imaginative, emotional, and often unconscious, this cognitive system allows us to respond effectively to emergencies such as a reckless SUV driver barreling into our highway lane.

We couldn't have lasted long as a species if we had stopped and deliberated every time we faced physical danger. "Most of our judgments and actions," Kahneman writes, "are appropriate most of the time."

The problem with this system is that it's error-prone. It doesn't seek out opposing views or competing scenarios. A stadium of screaming sports fans is a collective manifestation of intuitive thinking. It's an immediate, in-the-moment type of cognition.

Our brain, fortunately, has a second cognitive processor, which some call the Reflective System, located in newer parts of the brain. This system is a rational, deliberative, steady backup. It corrects mistakes and revises some of the quick, intuitive judgments of the Automatic System.

The Reflective System—or slow thinking—allows us to make choices consciously. Let's say your family sends you to a seafood retailer to buy some-

thing for dinner. Your choices are Chilean farmed salmon and locally caught shrimp. Your Reflective System kicks in because you will make a conscious choice.

It turns out that the local shrimp is expensive. Plus, your family prefers salmon. But you've heard about lowcountry shrimpers struggling to compete against floods of cheap, imported seafood. You prefer buying local products whenever possible, and local seafood is fresher and tastier.

Naturally, you step up and buy local shrimp.

The two systems—slow and fast—often operate in parallel or trade off. A jazz musician deploys slow thinking to choose which songs to play but uses the fast, creative, associative system—or "flow"—when deeply absorbed in performance.

A physician examining a patient with typical flu symptoms during flu season thinks with her fast Automatic System, retrieving memories of other flu patients in the past week. Her Reflective System won't kick in unless she finds something unexpected in the examination.

Slow thinking is accurate and reliable but tiring. It's costly in calories. Our bodies burn more energy when we think slowly. As glucose concentration in our blood stream falls, we lose mental focus. We can't concentrate for long, so we economize. Faced with an especially complicated problem, we tend to give up quickly.

Still, many tough decisions just won't go away.

Now imagine that you're calculating costs and benefits of flood-proofing your family's vacation cottage located on a very low-elevation site near the ocean. Its foundation has been dampened by lunar tides a few times a year.

Should you elevate the cottage on pilings? Should you relocate it farther inland where it's less likely to be flooded? Should you elevate or relocate your home now or wait a few years?

How much does elevating or moving a home actually cost? Should you wait until a hurricane knocks it down and then take the insurance money and add pilings to elevate the structure? Various members of the family have different ideas about how to flood-proof the cottage.

You're likely to throw up your hands and say you'll think about it another time.

"People have to consider so many things before they can measure risk," says Jessica Whitehead, regional

DECISIONS, DECISIONS. *You can buy tasty, fresh local seafood caught by lowcountry fishermen at Magwood Seafood on Shem Creek in Mt. Pleasant, S.C. (above). Or you can visit a supermarket and buy weeks' old but relatively inexpensive seafood shipped from thousands of miles away. Which would you choose?*
PHOTO/GRACE BEAHM

RESILIENT. *Volunteers erect sand fencing along the Wild Dunes beachfront on the Isle of Palms, S.C. "Doin' the Dunes" activities have helped stabilize beaches and reduce risks of storm surges damaging nearby homes during storms and extreme high tides.*
PHOTO/APRIL TURNER/S.C. SEA GRANT EXTENSION PROGRAM

climate extension specialist with the South Carolina and North Carolina Sea Grant programs. "Evaluating risk is different for everyone. You might have to factor in Granny's knees, her difficulty in walking up 15 steps to her front door if her home is elevated. Risk is so complex—can you blame people for not understanding it?"

COGNITIVE ILLUSIONS

Many of our irrational decisions are based on cognitive illusions inherited from our distant ancestors. These illusions helped them survive on African savannas, but they aren't nearly as useful today. Still, we're stuck with them.

"Our irrational behaviors are neither random nor senseless—they are systematic and predictable," writes Dan Ariely, a behavioral economist at Duke University. "We all make the same types of mistakes over and over, because of the basic wiring of our brains."

One of our common illusions is overconfidence. Most of us aren't as smart and capable as we think we are. Studies show that 90% of drivers view themselves as above average. Most students think that their smarts will put them at the top of their class. So who among them is mistaken?

We can't all be better than average students or drivers. Someone must belong to the bottom half. After all, we don't live in Garrison Keillor's "Lake Wobegon: where all the women are strong, all the men are good-looking, and all the children are above average."

As Kahneman points out, "Psychologists have confirmed that most people believe they are superior to most others on most desirable traits."

We also tend to gloss over risks in our lives. We know, of course, that bad things happen to people. But we tend to believe that bad things won't happen to us.

In psychological surveys, college students say that they will be less likely than their peers to suffer future misfortunes such as being fired from a job, getting divorced, having a drinking problem, suffering a heart attack, or getting cancer. Most people in most social categories, scientists say, are unrealistically optimistic about the future.

Perhaps that's why so many homeowners fail to renew flood or earthquake insurance policies, although such policies could protect them from ruinous financial losses.

The median tenure of flood insurance in the United States is just two to

SWAMPED. *A view of flooded New Orleans, La., following Hurricane Katrina in 2005. Despite mandatory evacuation orders, many residents chose not to move to higher ground as Katrina approached.*
PHOTO/MARK MORAN/NOAA AVIATION WEATHER CENTER

four years, according to the Risk Management and Decision Processing Center at the University of Pennsylvania. Some researchers suggest that homeowners drop flood policies because they view this form of insurance as an investment that has not paid off.

Or maybe homeowners just forgot why they bought insurance in the first place.

Craig E. Landry, an economist at East Carolina University in Greenville, N.C., and his colleagues studied home prices in Pitt County after a pair of major hurricanes, Fran in 1996 and Floyd in 1999, swelled rivers and caused extensive flood damage there.

The researchers found that home prices fell a total of about 5% in federally designated flood zones compared to non-flood-zone areas after Fran and a total of 8% after Floyd three years later. Buyers and sellers were accounting for flood risk in county home prices—for a time.

But this risk perception "decayed rapidly," says Landry. "It virtually disappeared four to five years after Floyd" as home prices in designated flood zones rose to match those outside flood zones. People apparently forgot the flood risk, didn't know about the risk, or decided that it didn't matter any more.

Most of us believe that we're rational most of the time. Not so. We tend to overestimate our intelligence and skill, overestimate our chances for future health and welfare, underestimate our vulnerability to certain kinds of risk, and usually forget disaster experiences after several years.

"We are normally blind about our own blindness," Kahneman has said. "We're generally overconfident in our opinions and our impressions and judgments."

The human brain works this way perhaps because life was so dangerous for our distant ancestors as they fought off predators and enemies. Perhaps optimistic, confident, risk-taking but capable individuals helped their kin-based groups survive in a hostile world

INFORMED ACTION. ***Communities along the South Carolina coast offer educational opportunities for residents who want to learn how to reduce risks from natural hazards.***
PHOTO/GRACE BEAHM

in competition against similar groups for food and resources. Under evolutionary pressures, successful leaders and their family members could have been more likely to reproduce and pass on their genes.

Today's entrepreneurs, artists, innovative scientists, and financial and political leaders are more likely to be "optimistic and overconfident, and to take more risks than they realize," Kahneman has said.

Our culture's leaders continually search for challenges and, if they fail once, they get up and rethink their strategy or look for a new objective. They have talent and luck but also persistence, tenacity, stamina, and nerve—personal qualities that the rest of us tend to admire and try to imitate.

NUDGING OR PUSHING

For decades, government agencies and nonprofit institutions have campaigned against risky behaviors such as smoking, abusing alcohol, and transmitting sexual diseases.

But public-education campaigns don't quickly move people to action. That's because they try to change *how people think*. We can't easily change our brain's hard-wired cognitive systems. A better strategy, some experts say, is to change *how people behave*.

Kahneman has said, "You've got to create situations so that [people will] make better decisions for themselves."

He has expressed admiration for a 2006 federal law that improved retirement planning for some Americans. This law provides incentives for private companies to enroll all new employees in 401k retirement plans. Employees can choose at any time to opt out of a company-sponsored retirement plan, but enrollment is the default option. Their 401k contributions are tax-deductible, accumulations are tax-deferred, and employers often match part of their employees' contributions.

In 2006, only a quarter of the nation's large companies automatically enrolled employees in their 401k plans. But three-fifths did so by 2010, according to a study by Aon Hewitt, a global human-resources consulting company that surveyed 120 large companies and three million employees.

Auto-enrollment in 401k pensions, experts say, is partly responsible for higher rates of retirement saving by

workers in those companies.

Today, the "nudge," so gentle and unobtrusive, is one of the hottest ideas in policymaking, an outgrowth of research by Kahneman and other scientists.

In 2008, Richard H. Thaler and Cass R. Sunstein, two University of Chicago professors, published a best-selling book, *Nudge: Improving Decisions About Health, Wealth, and Happiness*, in which they outline a number of practical, inexpensive government measures to solve social and economic problems.

Today, schools, health-care providers, government planners, and private companies are quietly nudging individuals away from some decisions and toward others.

Those who nudge, in the words of Thaler and Sunstein, are "self-consciously attempting to move people in directions that will make their lives better."

They call this process of nudging a form of "libertarian paternalism."

Libertarian paternalists, for instance, might recommend that schools display fruit early and at eye level in cafeteria lines before students can see potato chips or chicken nuggets. Hungry students will grab more of the foods they notice first.

Perhaps nudges can help create better habits in our food consumption and many other activities. More than 40 percent of the actions we take each day are governed by ingrained, unthinking habits, not by conscious choices, according to Duke University researchers.

If a child is nudged repeatedly toward fruits instead of candy bars, this might create a beneficial habit.

Both ends of the political spectrum have taken up nudging in policymaking because it can be effective in some circumstances without intrusions into private behavior and personal choices. Thaler is now a consultant for British Prime Minister David Cameron, the leader of the Conservative Party, while Sunstein serves in a senior position in President Barack Obama's administration.

Politicians like nudges, which allow people to make their own decisions. A nudge doesn't take away an individual's choice; it just encourages a person to make a better choice. Nudging is based on the principle that poor choices would still be available—but people would have to work a little harder to make those poor choices.

Policymakers might craft new rules that nudge property owners to hold hazard insurance for a longer period. Flood insurance policies could be attached to housing units rather than held by property owners themselves.

When a housing unit changes ownership, the new owner would automatically have responsibility for the flood policy. Also, each policy would be renewed every five years instead of every year, a small nudge to help people protect themselves from devastating financial losses.

Nudges are modest, gentle things—perhaps too modest and gentle in some cases.

What some coastal property owners really need is a firm push to prepare for hurricane winds, according to Smitty Harrison, executive director of the S.C. Wind and Hail Underwriting Association, commonly known as the "wind pool," which provides affordable "last-resort" wind coverage for thousands of homes near the coast.

All standard property insurers regulated by South Carolina must participate in the wind pool, created in 1971. But the wind pool otherwise functions much like any other state-regulated private insurer in terms of issuing policies, charging premiums, and paying claims. Numerous states have created similar special-hazard pools in segments of the market that most private insurers regard as far too risky.

"We're one of the few insurers to inspect the roofs annually," says Harrison. "We hire a company with certified roof inspectors who get up on roofs and check them for deterioration. There are many positive things about the South Carolina coast, but it's a terrible place for a roof. Sun, salt, wind, heat, and rain can just eat up a roof."

Intense hurricane winds can rip plywood sheathing off a roof and then force past the structure's "envelope," where it increases air pressure inside

HEALTHY CHOICE. *Children are "nudged" to choose fruit in the cafeteria line at Sanders-Clyde Elementary and Middle School in downtown Charleston, S.C.*
PHOTO/GRACE BEAHM

the building. If enough pressure grows inside the structure, it will break apart at its weakest point, usually the roof.

That's why a property owner must replace a deteriorated roof to acquire last-resort insurance coverage from South Carolina's wind pool.

Says Harrison, "Our roof inspections are really pushing you to protect yourself, pushing you to replace your roof if it's deteriorated and becomes the weakest part of the structure. This is for your benefit. If you have a 5% deductible on a $200,000 house, the first $10,000 of the loss will be yours."

Research shows that you can help your neighbors by replacing your roof, and they can do the same for you. Builders in coastal areas of South Carolina are required by code to attach a home's roof sheathing to rafters with additional nails, which reduces roof losses. When building materials fly off in high winds, they become dangerous airborne debris that can damage nearby homes.

Sea Grant researcher WeiChiang Pang, a civil engineer at Clemson University, says, "Your home will likely have less damage from flying debris during a hurricane if your neighbors have retrofitted their roofs or built new homes under current codes."

But many coastal homeowners, especially newcomers, don't realize how soon their roofs need replacing, according to Smitty Harrison. A roof near the ocean won't last nearly as long as an inland roof.

Some developers and homebuilders have fought tougher codes and enforcement, which they say drive up home prices and reduce buyers' choices. But over the long term stronger codes and enforcement can reduce disaster impacts and save homeowners money.

Standard insurers view strong building codes and enforcement as indicators of reliability in construction, so they tend to be more willing to issue new policies in those jurisdictions, according to Tim Reinhold, senior vice president of research and chief engineer at the Insurance Institute for Business and Home Safety.

BETTER PROTECTION. ***Roofers apply shingles to a housing complex on St. Philip Street in downtown Charleston, S.C. High winds can tear off deteriorated roofs and allow rain to pour into homes, causing major insured damages.***
PHOTO/GRACE BEAHM

When there are more standard insurers in a local market, there is more competition and potentially lower premiums.

We Americans have always been suspicious of restrictions on individual choices, even if those limits might protect us from harm. Our political system relies on choice, on the consent of the governed. A vote is a choice. Signing a petition is a choice. Joining an interest group is a choice. Our legal system is based in part on the principle that people make their own choices and must take responsibility for them.

Over the past several years, the country has engaged in numerous fierce debates about risk and choice. U.S. Supreme Court justices, members of Congress, and President Barack Obama have differing views about whether or not the federal government can require individuals to purchase health insurance to manage their health-care risks.

The reality is that understanding risk and choice will continue to be a difficult task because of our susceptibility to overconfidence and other cognitive errors.

Even scientists who study risk and choice struggle to apply what they have learned in experiments to their own daily lives. Kahneman reports that his own "intuitive thinking is just as prone to overconfidence [and other fallacies] as it was before [he] made a study of these issues."

Even so, Kahneman writes, we should become more conscious of our brain's illusions. We should remind ourselves again and again that we routinely underestimate risks and therefore misunderstand our choices. This is especially important to realize for those of us—half of the U.S. population—who have chosen to live in coastal areas, which are among the most dangerous locations on a dangerous planet.

DROUGHTS **HEAT WAVES** **FLOODS**

EXTREME EVENTS. *The Earth's atmosphere is storing more heat in the planet's climate system. As a result, climate change could be causing more frequent, intense, longer, and geographically larger droughts, heat waves, and floods. Climate change, moreover, could spawn more intense but less frequent giant hurricanes in the Atlantic Ocean.*

Memory and disaster forecasting

We create our life's forecasts out of our most recent or vivid memories.

If we've had an exciting first year at a new job, we expect many more. If we've enjoyed a happy first month of marriage, we forecast further happy ones. If a recent hurricane has left our home undamaged, we tend to think that it won't get damaged next time a hurricane strikes.

Scientists have a term for this: *availability bias*. Our strongest, most recent experiences and memories are more *available* to our conscious mind than older, less compelling ones.

"You react to what you've seen most recently," says Daniel Petrolia, an economist at Mississippi State University. "But what you've seen most recently might not be the key event."

If you've never experienced a hurricane, for instance, you are more likely to believe that your home and community are safe from tropical storms.

Smitty Harrison, executive director of the South Carolina Wind and Hail Underwriting Association (also known as the state's coastal "wind pool"), recalls a visit to a barrier island to meet local property owners and discuss trends in coastal hazard insurance.

"A lot of people have lived on the South Carolina coast less than five years," says Harrison. "Many are from Ohio and other states, and they have no experience of hurricanes. So Hurricane Hugo, in 1989, has been totally forgotten. Hurricane Floyd, in 1999, has been totally forgotten.

"A woman said to me, 'They made us evacuate last year because of a hurricane. If they call for another evacuation this year, I'm not leaving.' Another woman told me, 'We had a hurricane just two months ago.' And I said, 'No, that wasn't a hurricane. That was a bad thunderstorm.' "

Experiments show that our brain often depends on direct experience of a problem before we can comprehend it. Reading about a problem or hearing about it often doesn't suffice.

Perhaps that's why so many Americans have been skeptical of the science of human-influenced climate change—they believe they haven't directly experienced it.

The recent volatile weather in the United States, however, seems to be reshaping the public's comprehension of climate change.

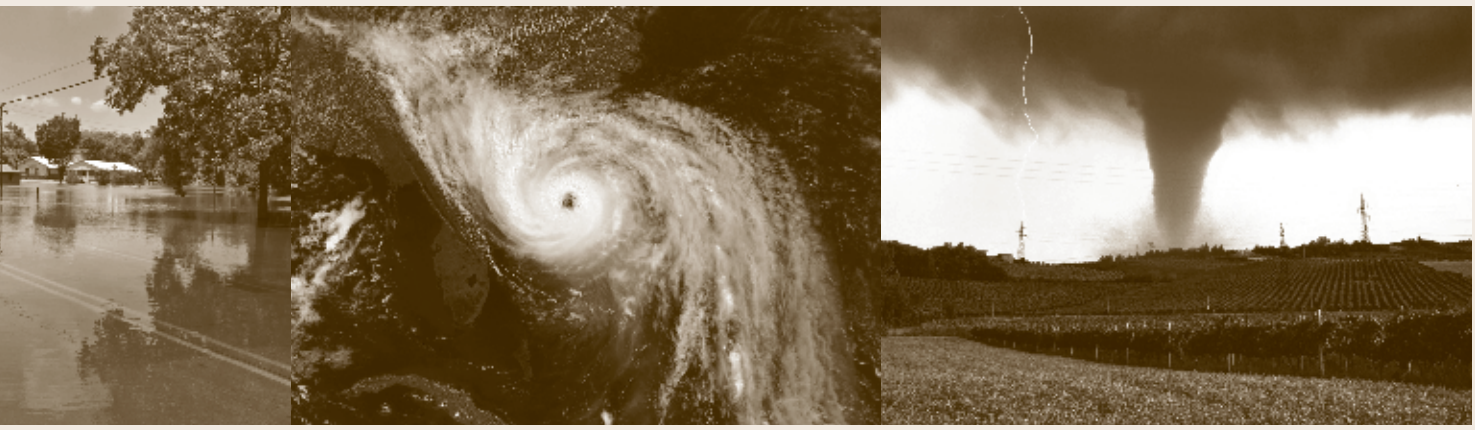
There's virtually no doubt that climate change will increase the number of weather-related risks around the world, scientists say. Over the past 30 years, global temperature has risen 0.6 degrees Celsius. This temperature rise will accelerate over time because of increasing greenhouse-gas concentrations in the Earth's atmosphere, which stores more heat in the planet's climate system and disrupts weather patterns around the world.

An Intergovernmental Panel on Climate Change's 2012 report says: "A changing climate leads to changes in the frequency, intensity, spatial extent, duration, and timing of extreme weather and climate events, and can result in unprecedented extreme weather and climate events."

In 2011, Americans experienced a record-breaking 14 weather disasters that caused $1 billion or more in damages and killed scores of people. These disasters included a severe drought in the Great Plains, tornadoes in the Midwest, and floods in the Mississippi River Valley.

None of these disasters and weather extremes in isolation can be blamed directly on climate change, according to Jessica Whitehead,

HURRICANES **TORNADOES**



Scientists, though, lack data to determine whether or not climate change has influenced outbreaks of fast-moving, very powerful tornadoes in the United States.
PHOTOS/DREAMSTIME

regional climate extension specialist with the South Carolina and North Carolina Sea Grant programs. "The most we can do is to draw parallels to climate change and say that this pattern of extreme weather events will become more common," she says.

But 69% of surveyed Americans already agree that global warming is affecting weather in the United States, according to a poll released in April 2012 by Yale University and George Mason University.

Surveyed Americans were asked whether they attributed certain extreme weather events to climate change. By more than a two-to-one margin, Americans agreed that the unusually warm 2011-2012 winter, the record high temperatures in 2011, and the drought in Texas and Oklahoma could be linked to a changing climate.

Smaller but still strong majorities linked climate change to the Mississippi River floods in 2011, record winter snowfall in 2010 and 2011, and Hurricane Irene in August 2011.

One of the poll's surprising findings is that 35% of the public reported being affected by extreme weather in the past year. In 2011, a long string of disasters—droughts, floods, hurricanes, heat waves, and tornadoes—affected virtually every region of the country.

In the past, climate change seemed far away in time and space, potentially affecting South Carolinians in 2050 or polar bears today. But now many Americans believe that they have had immediate experience with disasters caused by global warming.

Yet this new perception of links between climate change and extreme weather events might not last.

If the United States experiences a few colder winters in a row and fewer weather-related disasters, many Americans might do an about-face and say that climate isn't changing after all. "People," says Whitehead, "have such short memories."

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NEWS & NOTES

Survey indicates local support for offshore wind turbines

Within the next decade, wind turbines could be operating off the South Carolina coast, their blades capturing ocean winds and producing clean, renewable energy for coastal communities. But proposals to install manmade industrial projects in near-shore ocean waters have historically faced strong opposition among coastal landowners and "marine recreationists"—that is, people who are strongly attached to coastal and ocean places.

Marine recreationists have often opposed projects because of perceived loss of aesthetic appeal, concern over possible losses of fishing areas, and impacts to wildlife.

A new survey, though, shows that 73% of marine recreationists, such as beach users and anglers, report some level of support for wind energy in the North Myrtle Beach and Georgetown areas of South Carolina. These two areas, which have the state's strongest winds close to shore, are among the most feasible sites for wind turbines.

Nearly three-fourths of surveyed "marine recreationists" showed some support for offshore wind energy.
PHOTO/DREAMSTIME

Sea Grant researcher Matthew Brownlee, who recently completed a Ph.D. in parks, recreation, and tourism management at Clemson University, and his colleagues surveyed 657 residents.

About 25% of people surveyed reported some level of opposition to offshore wind energy in the study region. The most frequent reason for opposition is that offshore wind energy would supposedly reduce scenic and natural beauty. Overall, however, people surveyed generally lacked a willingness or high likelihood to engage in civic action to oppose wind energy or support it.

The S.C. Sea Grant Consortium provided "seed" funds to support this research. Study results have been provided to members of the South Carolina Regulatory Task Force for Coastal Clean Energy, representatives of state and federal natural-resource agencies, and public and private energy providers for their use as proposals for wind-energy development are offered.

For more information and to download a PDF of the final report, visit www.scseagrant.org/content/?cid=156.

USC professor recognized with state environmental award

Patricia DeCoursey received the 2011 South Carolina Environmental Awareness Award, which recognizes South Carolinians who are doing extraordinary work on behalf of our environment.

Patricia DeCoursey receiving the Environmental Awareness Award from State Forester Henry E. Kodama.
PHOTO/BRETT WITT/S.C. DEPT. OF NATURAL RESOURCES

DeCoursey, a biologist at the University of South Carolina since 1976, received the award for her volunteer efforts in creating small urban forests and gardens.

In 2006, she took over restoration of an abandoned woodlot donated to the university about half a century ago. She tirelessly volunteered thousands of hours (and coordinated the efforts of thousands of other volunteers) to create a valuable teaching and conservation outreach facility, the W. Gordon Belser Arboretum, representing 10 different biomes.

"Her aim was to create representative plant communities typical of South Carolina that would be used for teaching," said Guy Sabin, Environmental Program Manager with the S.C. Forestry Commission. "She combined her enthusiasm with her ability to recruit quality volunteers and accomplished her goals at a surprisingly low cost. Ultimately, she gave an invaluable gift to the people of South Carolina."

Each year the public is invited to

NEWS & NOTES

submit nominations to the awards committee. This committee is made up of representatives from the state's natural resource agencies, including the Department of Health and Environmental Control, the Department of Natural Resources, S.C. Forestry Commission, and the S.C. Sea Grant Consortium.

Susan Ferris Hill of the S.C. Sea Grant Consortium and Denise Sanger, formerly with the Consortium and now with the Department of Natural Resources, served on the committee.

Candidates for the award should demonstrate innovation and leadership. His or her accomplishments will have led to positive change or may have influenced matters affecting the natural environment.

The S.C. General Assembly established the S.C. Environmental Awareness Award in 1992. It's now in its 19th year recognizing outstanding contributions made toward the protection, conservation, and improvement of South Carolina's natural resources.

Litter cleanup volunteers needed

Join S.C. Sea Grant Consortium and S.C. Department of Natural Resources for the 24th annual Beach Sweep/River Sweep on Saturday, September 15, 2012. Last year over 3,000 dedicated volunteers removed 20 tons of debris from our beaches, marshes, and waterways, but there is more work to be done.

Beach Sweep/River Sweep—South Carolina's largest one-day cleanup—is held each year in conjunction with the Ocean Conservancy's International Coastal Cleanup. A list

Young volunteers from the McClellanville area help sort recyclables collected from Jeremy Creek during the 2011 Beach Sweep/River Sweep.
PHOTO/SUSAN HINDMAN

of coastal site captains and areas covered is available online at www.scseagrant.org/content/?cid=49. Simply choose a site and contact the site captain directly to let them know you'd like to join their team. If you're interested in cleaning a needy area that is not listed, please contact Susan Ferris Hill, coastal coordinator, at (843) 953-2092 or susan.ferris.hill@scseagrant.org. Volunteers who want to help inland may contact Bill Marshall at (803) 734-9096 or marshallb@dnr.sc.gov.

Beach Sweep/River Sweep is funded primarily from private sources. Major sponsors for the 2011 cleanup were Ashbritt, Inc., BP Cooper River Plant, Charleston City Marina, Charleston Water System, Coastal Expeditions, Mt. Pleasant Waterworks, The Duke Energy Foundation, and Walmart Market #34.

Consortium honored by Sea Grant Association

At a biannual meeting in March, the Sea Grant Association (SGA) presented the S.C. Sea Grant Consortium with the Partnership Award "for its long-standing commitment to Sea Grant and the SGA."

The SGA also recognized Elaine Knight, who was then the Consortium's assistant director, with a Distinguished Service Award "for her dedicated service and outstanding contributions."

The SGA is a non-profit organization dedicated to furthering the National Sea Grant College Program. More information about the SGA and its work is available on their website at www.sga.seagrant.org.

New employee joins Consortium

Ryan Bradley
PHOTO/SUSAN FERRIS HILL/S.C. SEA GRANT CONSORTIUM

Ryan Bradley has joined the S.C. Sea Grant Consortium team as an accountant/fiscal analyst. Ryan was previously employed by the South Carolina Department of Motor Vehicles where he was the agency's budget lead.

Ryan is a graduate of Rutgers University with a degree in economics, and he participated on the Division I baseball team during his time at the university.

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EBBS & FLOWS

S.C. Water Resources Conference

Columbia, South Carolina
October 10-11, 2012

Coordinated by Clemson University's Center for Watershed Excellence in conjunction with a statewide planning committee, this conference will provide an integrated forum for discussion of water policies, research projects, and water management in the state. The program schedule features five tracks and six sessions over two days with 90 oral presenters. For more information, visit www.scwaterconference.org.

Region 4 Stormwater Compliance Conference

Panama City, Florida
November 13-15, 2012

This year's conference is focusing on Low Impact Development with presentations by MS4 directors, Environmental Protection Agency, National Stormwater Center, and more. For colleagues who did not make the first conference in Griffin, Ga., the Certified Stormwater Inspector class will be added as a special pre-conference event. Visit www.npdes.com and click on "Special Events" for more information.

Aquaculture and Restoration: A Partnership

Groton, Connecticut
December 12-15, 2012

Plan to attend a special joint meeting of the Northeast Aquaculture Conference and Exposition, the Milford Aquaculture Seminar, and the International Conference on Shellfish Restoration. There will be oral presentations, plus poster and technology-transfer sessions on shellfish culture, shellfish restoration, and finfish and seaweed aquaculture. For more information, visit www.northeastaquaculture.org.

Subscriptions are free upon request by contacting: Annette.Dunmeyer@scseagrant.org

ATTENTION SCHOOL TEACHERS! The S.C. Sea Grant Consortium has designed supplemental classroom resources for this and past issues of *Coastal Heritage* magazine. *Coastal Heritage Curriculum Connection*, written for K-12 educators and their students, is aligned with the South Carolina state standards for the appropriate grade levels. Includes standards-based inquiry questions to lead students through explorations of the topic discussed. *Curriculum Connection* is available on-line at www.scseagrant.org/education.